

CLAIMS:

1. A signal analysis instrument, comprising:
  - a computer;
  - a phase shift mechanism comprising:
    - an input for receiving a first high frequency signal;
    - a phase shifter arranged to act on said first high frequency signal to produce a phase-shifted first high frequency signal;
    - a phase shift controller arranged to control operation of the phase shifter in response to instructions from said computer;
  - a receiver mechanism, comprising:
    - a mixer responsive to the phase-shifted first high frequency signal and to a second high frequency signal to produce a mixer output signal therefrom;
    - a first signal conditioning circuit responsive to the mixer output signal to produce a receiver output signal;
  - a data acquisition mechanism responsive to the receiver output signal, the computer being connected to the data acquisition mechanism to receive data therefrom;
  - said computer arranged to control said phase shifter and to analyse data from said data acquisition mechanism to determine a position of said phase shifter corresponding to said mixer being phase-sensitive, and to determine a conversion ratio of said receiver mechanism.
2. A signal analysis instrument as claimed in claim 1, wherein said phase shifter comprises a trombone phase shifter actuated by a stepper motor having count means arranged to provide an indication of the number of steps taken by the stepper motor, said phase shift controller arranged to count the number of steps from said counter and to communicate the number of steps to the signal analysis instrument.
3. A signal analysis instrument as claimed in claim 2, wherein said phase shift controller is arranged, in response to an instruction received from the signal analysis instrument, to control operation of said phase shifter to a position specified in said instruction corresponding to a number of steps of the stepper motor.
4. A signal analysis instrument as claimed in claim 2, said phase shifter further comprises a plurality of cable lengths and switches, said switches being operable under control of the

phase shift controller to selectively connect said cable lengths in electrical series with said trombone phase shifter.

5. A signal analysis instrument as claimed in claim 2, wherein said phase shift mechanism is provided integral to said receiver mechanism.
6. A signal analysis instrument as claimed in claim 2, wherein said phase shift mechanism is an external device, said phase shift controller and said computer being in communication via an external communications bus.
7. A signal analysis instrument as claimed in claim 1, wherein said receiver mechanism further comprises:
  - a counter responsive to the first or second high frequency signal to provide a frequency count thereof; and
  - a receiver controller being arranged to read the frequency count from said counter and to communicate said frequency count to said computer.
8. A signal analysis instrument as claimed in claim 1, wherein said receiver controller is arranged, in response to an instruction received from the signal analysis instrument via the communications bus, to read the frequency count from said frequency counter and to communicate said frequency count to the signal analysis instrument.
9. A signal analysis instrument as claimed in claim 1, wherein said receiver mechanism further comprises a power detection circuit to detect the level of microwave signal power in said second high frequency signal, said receiver controller being arranged to read said level of microwave signal power from said first power detection circuit and to communicate said level to said computer.
10. A signal analysis instrument as claimed in claim 9, wherein said receiver controller is arranged, in response to an instruction received from the computer, to read the level of microwave signal power in said second high frequency signal from the power detection circuit, and to communicate the read level to the computer.
11. A signal analysis instrument as claimed in claim 1, wherein said receiver mechanism further comprises a low frequency input for receiving a low frequency signal, a first switch being provided before the first signal conditioning circuit operable under control

of the receiver controller to connect either the mixer or the low frequency input to the first signal conditioning circuit.

12. A signal analysis instrument as claimed in claim 1, said instrument comprising at least two receiver mechanism.
13. A signal analysis instrument as claimed in claim 1, wherein each receiver mechanism is provided in a module housing, said instrument including a bay for receiving a plurality of module housings.
14. A signal analysis instrument as claimed in claim 1, wherein said computer is arranged, in response to a user command, to issue instructions to a receiver controller to:
  - read and communicate to the computer the frequency count of the second high frequency signal;
  - control operation of said phase shifter to position said phase shifter to a plurality of positions in sequence, said computer arranged to store each position of the phase shifter and the measured module output signal from the data acquisition mechanism corresponding with said phase shifter position in an array;
  - said computer arranged to determine a conversion factor for a residual phase noise measurement performed via said module from the frequency count and the array of phase shifter positions and measured module output signals.
15. A signal analysis instrument as claimed in claim 1, further comprising:
  - a phase locked loop circuit;
  - each receiver mechanism further comprising:
    - a phase locked loop output for providing a phase locked loop signal to the phase locked loop circuit;
    - a second switch provided at the phase locked loop output, the second switch operable under control of the receiver controller to connect either the mixer or the low frequency input to the phase locked loop output.
16. A receiver for a signal analysis instrument, comprising:
  - first and second high frequency inputs for receiving first and second high frequency signals;
  - a mixer connected to the first and second high frequency inputs to produce a mixer output signal from the first and second high frequency signals;

a phase shifter provided between the second high frequency input and the mixer;  
frequency counter responsive to one of the first or second high frequency signals to provide a frequency count thereof;  
receiver controller arranged to control operation of the phase shifter, said receiver controller being connected to said frequency counter to read the frequency count therefrom, and to communicate the frequency count to the signal analysis instrument;  
and  
a first signal conditioning circuit responsive to the mixer output signal to produce an output signal.

17. A receiver as claimed in claim 16, wherein said receiver controller is arranged, in response to an instruction received from the signal analysis instrument, to read the frequency count from said frequency counter and to communicate said frequency count to the signal analysis instrument.
18. A receiver as claimed in claim 16, wherein said receiver controller is arranged, in response to an instruction received from the signal analysis instrument, to control operation of said phase shifter to move said phase shifter to a position specified in said instruction.
19. A receiver as claimed in claim 18, wherein said phase shifter comprises a trombone phase shifter actuated by a stepper motor having count means arranged to provide an indication of the number of steps taken by the stepper motor, said receiver controller arranged to count the number of steps from the count means and to communicate the number of steps to the signal analysis instrument.
20. A receiver as claimed in claim 16, further comprising a power detection circuit arranged to detect the level of microwave signal power present at the first high frequency input, said receiver controller being arranged to read said level of microwave signal power from said power detection circuit and to communicate said level to said instrument.
21. A receiver as claimed in claim 16, wherein said receiver controller is arranged, in response to an instruction received from the signal analysis instrument, to read the level of microwave signal power present at the first input from the power detection circuit, and to communicate the measured power to the signal analysis instrument.

22. A receiver as claimed in claim 16, wherein the receiver further comprises a low frequency input for receiving a low frequency signal, and a first switch provided before the first signal conditioning circuit, the first switch means operable under control of the receiver controller to connect either the mixer or the low frequency input to the first signal conditioning circuit.
23. A receiver as claimed in claim 16, further comprising a phase locked loop output for providing a phase locked loop signal to the signal analysis instrument, and second switch provided at the phase locked loop output, the second switch operable under control of the receiver controller to connect either the mixer or the low frequency input to the phase locked loop output.